

Ulrich STEINBRENNER et al, SN 10/030,634
This Amdt. filed April 23, 2004
Responsive to the OA of Feb. 11, 2004

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claims 1-17 (previously canceled).

18. (Currently amended) A method for operating a fuel metering system (11) of a direct-injection internal combustion engine (1) in which the fuel metering system has a fuel supply container (12), at least one prefeed pump (13) for pumping fuel out of the fuel supply container (12) into a low-pressure region (ND) of the fuel metering system (11), a high-pressure pump assembly having at least two high-pressure pumps (14, 15) for pumping fuel out of the low-pressure region (ND) into at least one high-pressure reservoir (16; 16', 16"), a control unit (22) for regulating an injection pressure (P_i) prevailing in the high-pressure reservoir (16; 16', 16"), and fuel injection valves (9) for injecting fuel out of the high-pressure reservoir (16; 16', 16") into combustion chambers (4) of the engine (1), the method comprising providing the fuel metering system (11) with one fuel circuit for metering fuel into all the combustion chambers (4) of the engine (1), connecting all the high-pressure pumps (14, 15) in the fuel circuit, and triggering all the high-pressure pumps (14, 15) independently of one another via a common pressure regulating circuit, wherein the high-pressure pumps (14, 15) are triggered with the same triggering time signal (T).

Ulrich STEINBRENNER et al, SN 10/030,634

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19. (Previously added) The method of claim 18, wherein the high-pressure pumps (14, 15) are triggered parallel to one another.

20. (Previously added) The method of claim 18, wherein one or more first high-pressure pumps (14) are triggered oppositely from one or more second high-pressure pumps (15).

21. (Canceled)

22. (Currently amended) A fuel metering system (11) of a direct-injection internal combustion engine (1), comprising a fuel supply container (12), at least one prefeed pump (13) for pumping fuel out of the fuel supply container (12) into a low- pressure region (ND) of the fuel metering system (11), a high-pressure pump assembly having at least two high-pressure pumps (14, 15) for pumping fuel out of the low-pressure region (ND) into at least one high-pressure reservoir (16; 16', 16"), a control unit (22) for regulating an injection pressure (P_r) prevailing in the high-pressure reservoir (16; 16', 16"), and fuel injection valves (9) for injecting fuel out of the high-pressure reservoir (16; 16', 16") into combustion chambers (4) of the engine (1), the fuel metering system (11) having one fuel circuit for metering fuel into all the combustion chambers (4) of the engine (1), all the high-pressure pumps (14, 15) being disposed in the fuel circuit, and the control unit (22) including one pressure regulating circuit for all the high-pressure pumps (14, 15), the high- pressure pumps (14, 15) being triggerable independently of one another via the pressure regulating

Ulrich STEINBRENNER et al, SN 10/030,634

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circuit, wherein the high-pressure pumps (14, 15) are triggered with the same triggering time signal (T).

23. (Previously added) The fuel metering system (11) of claim 22, wherein the high-pressure pump assembly has two high-pressure pumps (14, 15).

24. (Previously added) The fuel metering system (11) of claim 22, wherein the control unit (22) triggers the high-pressure pumps (14, 15) parallel to one another.

25. (Previously added) The fuel metering system (11) of claim 23, wherein the control unit (22) triggers the high-pressure pumps (14, 15) parallel to one another.

26. (Previously added) The fuel metering system (11) of claim 22, wherein the control unit (22) triggers one or more first high-pressure pumps (14) oppositely from one or more second high-pressure pumps (15).

27. (Previously added) The fuel metering system (11) of claim 23, wherein the control unit (22) triggers one or more first high-pressure pumps (14) oppositely from one or more second high-pressure pumps (15).

28. (Previously added) The fuel metering system (11) of claim 22, wherein the control unit (22) triggers the high-pressure pumps (14, 15) with the same triggering time signal (T).

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29. (Previously added) The fuel metering system (11) of claim 23, wherein the control unit (22) triggers the high-pressure pumps (14, 15) with the same triggering time signal (T).
30. (Previously added) The fuel metering system (11) of claim 24, wherein the control unit (22) triggers the high-pressure pumps (14, 15) with the same triggering time signal (T).
31. (Previously added) The fuel metering system (11) of claim 25, wherein the control unit (22) triggers the high-pressure pumps (14, 15) with the same triggering time signal (T).
32. (Previously added) The fuel metering system (11) of claim 26, wherein the control unit (22) triggers the high-pressure pumps (14, 15) with the same triggering time signal (T).
33. (Previously added) The fuel metering system (11) of claim 27, wherein the control unit (22) triggers the high-pressure pumps (14, 15) with the same triggering time signal (T).
34. (Currently amended) In a fuel metering system (11) of a direct-injection internal combustion engine (1), including a fuel supply container (12), at least one prefeed pump (13) for pumping fuel out of the fuel supply container (12) into a low- pressure region (ND) of the fuel metering system (11), a high-pressure pump assembly having at least two high-pressure pumps (14, 15) for pumping fuel out of the low-

pressure region (ND) into at least one high-pressure reservoir (16; 16', 16"), a control unit (22) for regulating an injection pressure (P_r) prevailing in the high-pressure reservoir (16; 16', 16"), and fuel injection valves (9) for injecting fuel out of the high-pressure reservoir (16; 16', 16") into combustion chambers (4) of the engine (1), the improvement wherein the fuel metering system (11) comprising one fuel circuit for metering fuel into all the combustion chambers (4) of the engine (1), all the high-pressure pumps (14, 15) being disposed in the fuel circuit, and the control unit (22) including one pressure regulating circuit for all the high-pressure pumps (14, 15), the high-pressure pumps (14, 15) being triggerable independently of one another via the pressure regulating circuit, **wherein the high-pressure pumps (14, 15) are triggered with the same triggering time signal (T).**

35. (Previously added) The fuel metering system (11) of claim 34, wherein the high-pressure pump assembly has two high-pressure pumps (14, 15).

36. (Previously added) The fuel metering system (11) of claim 34, wherein the control unit (22) triggers the high-pressure pumps (14, 15) parallel to one another.

37. (Previously added) The fuel metering system (11) of claim 35, wherein the control unit (22) triggers the high-pressure pumps (14, 15) parallel to one another.

38. (Previously added) The fuel metering system (11) of claim 34, wherein the control unit (22) triggers one or more first high-pressure pumps (14) oppositely from one or more second high-pressure pumps (15).

Ulrich STEINBRENNER et al, SN 10/030,634
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39. (Previously added) The fuel metering system (11) of claim 35, wherein the control unit (22) triggers one or more first high-pressure pumps (14) oppositely from one or more second high-pressure pumps (15).

40. (Previously added) The engine (1) of claim 34, characterized in that the engine (1) has at least six cylinders (3).

41. (Previously added) The engine (1) of claim 34, wherein the fuel metering system (11) has two high-pressure reservoir regions (16', 16"), which communicate with one another via a pressure equalization line (26).

42. (Currently amended) In a control unit (22) for a fuel metering system (11) of a direct-injection internal combustion engine (1), which includes a fuel supply container (12), at least one prefeed pump (13) for pumping fuel out of the fuel supply container (12) into a low-pressure region (ND) of the fuel metering system (11), a high-pressure pump assembly having at least two high-pressure pumps (14, 15) for pumping fuel out of the low-pressure region (ND) into at least one common rail (16; 16', 16"), the control unit (22) for regulating an injection pressure (P_r) prevailing in the high-pressure reservoir (16; 16', 16"), and fuel injection valves (9) for injecting fuel out of the high-pressure reservoir (16; 16', 16") into combustion chambers (4) of the engine (1), the improvement wherein the fuel metering system (11) has one fuel circuit for metering fuel into all the combustion chambers (4) of the engine (1), and all the high-pressure pumps (14, 15) are disposed in the fuel circuit, and that the control unit (22) triggers all the high-pressure pumps (14, 15) independently of one

another via a common pressure regulating circuit, wherein the high-pressure pumps (14, 15) are triggered with the same triggering time signal (T) .

43. (Previously added) The control unit (22) of claim 42, wherein the control unit (22) triggers the high-pressure pumps (14, 15) parallel to one another.

44. (Previously added) The control unit (22) of claim 42, wherein the control unit (22) triggers one or more first high-pressure pumps (14) oppositely from one or more second high-pressure pumps (15).

45. (Previously added) The control unit (22) of claim 42, wherein the control unit (22) triggers the high-pressure pumps (14, 15) with the same triggering time signal (T).

46. (Previously added) The control unit (22) of claim 43, wherein the control unit (22) triggers the high-pressure pumps (14, 15) with the same triggering time signal (T).

47. (Previously added) The control unit (22) of claim 44, wherein the control unit (22) triggers the high-pressure pumps (14, 15) with the same triggering time signal (T).

48. (Previously added) A control element, in particular a read-only memory (ROM) or flash memory, for a control unit (22) of a direct-injection internal combustion engine (1), in which a program is stored in memory that is capable of being run on a

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computer, in particular a microprocessor, and is suitable for performing a method of
claim 18.